

Identification of Doped Nitrogen in Photocatalytic TiO₂

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Anion doped titanium dioxide (TiO₂), which is expected to exhibit an improved photo-catalytic property due to the effect of narrowing in the band gap, was investigated by small-angle neutron scattering (SANS). Among wide variety of photo-catalytic products, TiO₂ is one of the most promising and various improvements have been done [1]. On the functional aspect it has been confirmed that for instance, nitrogen (N) doped TiO₂ can be activated not only by the photons of which wavelength is corresponding to ultraviolet

but also by those of visible light and thereby an enhancement of the efficiency is attained [2]. However, the difference in structure between bare TiO₂ and N-doped TiO₂ has not yet definitively clarified despite the considerable structural analyses by using x-ray probes such as x-ray diffraction or x-ray photoemission spectroscopy [3]. With profiting from an enhanced scattering length of N atoms to the neutron beam, an attempt to capture the distribution of N atoms in the N-doped TiO₂ by SANS is presented here. Specimens prepared by different protocols were compared. A striking feature observed on the granular type specimens is that when those specimens were soaked in mixed water of H₂O/D₂O=55/45, of which scattering length density is tuned to TiO₂, bare TiO₂ specimen (filled yellow circles) exhibited a considerable scattering intensity (even larger than that of N-doped specimen). While the specimens put in air, exhibited a likely behavior. The N-doped specimen possessed a larger scattering intensity at small q -range of $q < 0.4\text{nm}^{-1}$, probably due to the existence of doped N atoms.

References

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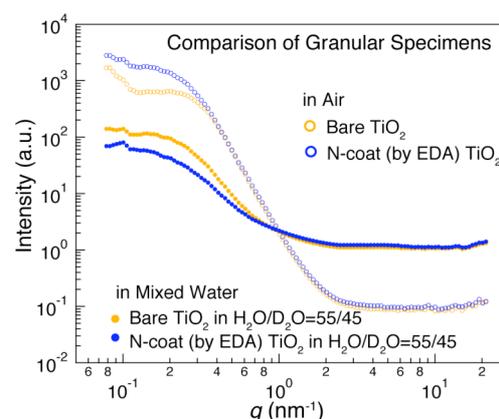


Fig. 1 Bare and N- doped TiO₂ for granular products.